**Piezo VOA 3.4 Manual**

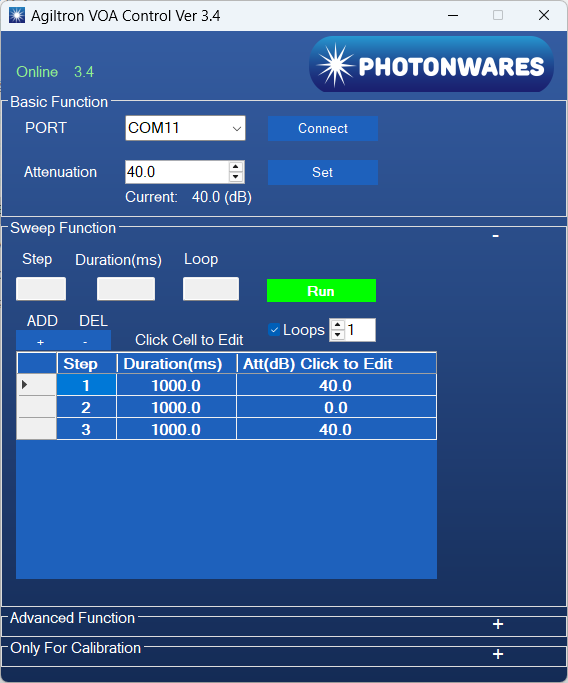


Figure 1. Test GUI

**Control via Windows GUI:**

**Basic:**

1. Connect device



Choose the correct COM port, then click “Connect” button to connect with the device.

1. Set target DB for VOA



Type the DB value in the number box, then click “Set” button to set target DB value. The current DB value would change to the set value if successful.

DB value 1000 means -10.00 DB attenuation.

**Sweep Function:**

Edit an operation sequence

Add step: click the “+(ADD)” button would both add a step to the Programmable Running Sheet.

Delete step: click the “-(DEL)” button would both delete a step in the Programmable Running Sheet.

Edit step: There are two things that you can modify for one step. One is the VOA setting, and the other is the duration for each step. Double click the cell that you want to modify, and the program will allow you to modify the setting.

Looping Operation

Check the Looping Activation option box to loop through the operating sequence a selected number of times. Enter the number of loop cycles or use the adjustor arrows to increase or decrease the loop count. The program will automatically execute the operating sequence the number of times indicated by the loop count.

Running an Operation Sequence

Click on the “RUN” button to start an operating sequence. Once started, the “RUN” button label will change to “STOP”. Click on the “STOP” to abort the operating process.

The current step of a running operating sequence will be highlighted with a yellow background color.

The number displayed in the “Current Step” block indicates the current sequence step even if the sequence was stopped and corresponds to the yellow highlighted row in the run time sheet. The number displayed on the “Current Loop” block shows the number of cycles the running sequence has completed.

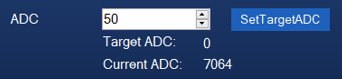
**Advanced**

1. Control Piezo VOA via DAC (Directly set voltage)



Type the value of DAC in the number box, then click “Set” button to set the value. The value should be between 0 and 4000.

1. Control Piezo VOA via ADC (Feedback control, maintain the ADC to a certain value)



Type the target ADC value in the number box and click “SetTargetADC” button to set TargetADC value of device. The device would automatically modify the voltage to maintain CurrentADC to matach TargetADC.

1. Set Piezo VOA RDAC (Change the gain of Feedback control

Graphical user interface, application

Description automatically generated

Set RDAC1 and RDAC2 value in number box and click “SetRDAC1” and “SetRDAC2” buttons to set the RDAC value. RDACx works as the gain of Feedback control. The bigger the value of RDAC, the attenuation range of VOA would be larger. RDAC1 and RDAC2 can be set a value between 1 and 1023.

For example,

RDAC1=5, RDAC2=1, the attenuation range of VOA is -1 ~ -20 dB.

RDAC1=15, RDAC2=1, the attenuation range of VOA is -20 ~ -40 dB.

The attenuation range would be different for different devices.

If you plan to manually set RDAC for your own implementation, always set RDAC1 first.

1. Manage Table in Flash
2. Click “ReadFromFlash” button. A “table.csv” would be created or overwritten.
3. Click “CalibrationTable” button. A window would show as below.

Table

Description automatically generated with medium confidence

1. Click “ReadTable” button. All the data from the table would be filled in the window.

Table

Description automatically generated

1. Then the window would ready for checking or modifying.
2. If any changes are made, click “Generate” button. The “table.csv” would be created or overwritten.
3. Click “DownloadTable” button on the main window. The new table would be downloaded into the flash.

**Control via UART command (in HEX):**

The baud rate setting is 115200-N-8-1.

**Basic:**

1. Set DB num:

0x01 0x12 <DB higher byte> <DB lower byte>

Return: None

Example: 0x01 0x12 0x03 0xE8 -> set device to -10.00 DB

1. Check Current DB num:

0x01 0x1A 0x00 0x00

Return <Current DB higher byte> <Current DB Lower byte>

Example: 0x01 0x1A 0x00 0x00 RTN: 0x03 0xE8 -> The current DB is set to -10.00 DB

1. Identify Device:

Explain: This command can be used to check whether the correct COM port is used.

0x01 0x02 0x00 0x00

Return 0x41 0x30

1. Check Piezo VOA Board Version:

0x01 0x03 0x00 0x00

Return 0x03 0x00

Explain: If return 0x03 0x00, this board is version 3.0. Otherwise, some functions in this manual may not apply to the board.

**Advanced:**

1. Set DAC value ( VOA voltage):

Explain: This command directly controls the voltage applied to the VOA. This command is for testing.

0x01 0x13 <DAC higher byte> <DAC lower byte> (DAC is a value between 0-4095>

Return <DAC higher byte> <DAC lower byte>

1. Read current VOA voltage:

0x01 0x14 <DAC higher byte> <DAC lower byte>

Return <DAC higher byte> <DAC lower byte>

1. Set Target ADC value:

0x01 0x16 <ADC higher byte> <ADC lower byte>

Return <ADC higher byte> <ADC lower byte>

1. Read ADC status:

Explain: Read current ADC value and target ADC value.

0x01 0x15 0x00 0x00

Return <Current ADC higher byte> <Current ADC lower byte> <Target ADC higher byte> <Target ADC lower byte>

1. Set RDAC1 value:

0x01 0x17 <RDAC1 higher byte> <RDAC1 lower byte>

Return <RDAC1 higher byte> <RDAC1 lower byte>

1. Set RDAC2 value:

0x01 0x18 <RDAC2 higher byte> <RDAC2 lower byte>

Return <RDAC2 higher byte> <RDAC2 lower byte>

1. Read RDACs value:

0x01 0x19 0x00 0x00

Return <RDAC1 higher byte> <RDAC1 lower byte> <RDAC2 higher byte> <RDAC2 lower byte>

1. Read Flash address:

Explain: This command can be used to read the value of address in device flash.

0x01 0x1C <address high byte> <address low byte>

Return <address byte>

**Appendix I. Full Table in Flash**

Table:

|  |  |  |
| --- | --- | --- |
| Address | Hex | Description |
| 0 | 0x000 | If device need calibration. 0: Not calibrated 1: Already calibrated |
| 1 | 0x001 | 0xFF |
| 2 | 0x002 | 0xFF |
| 3 | 0x003 | 0xFF |
| 4 | 0x004 | Channel 1 Max DB value – high byte |
| 5 | 0x005 | Channel 1 Max DB value – low byte |
| 6 | 0x006 | Channel 1 RDAC1 value – high byte |
| 7 | 0x007 | Channel 1 RDAC1 value – low byte |
| 8 | 0x008 | Channel 1 RDAC2 value – high byte |
| 9 | 0x009 | Channel 1 RDAC2 value – low byte |
| 10 | 0x00A | Channel 1 ADC Table[0] – high byte |
| 11 | 0x00B | Channel 1 ADC Table[0] – low byte |
| 12 | 0x00C | Channel 1 ADC Table[1] – high byte |
| 13 | 0x00D | Channel 1 ADC Table[1] – low byte |
| 14 | 0x00E | Channel 1 ADC Table[2] – high byte |
| 15 | 0x00F | Channel 1 ADC Table[2] – low byte |
| 16 | 0x010 | Channel 1 ADC Table[3] – high byte |
| 17 | 0x011 | Channel 1 ADC Table[3] – low byte |
| 18 | 0x012 | Channel 1 ADC Table[4] – high byte |
| 19 | 0x013 | Channel 1 ADC Table[4] – low byte |
| 20 | 0x014 | Channel 1 ADC Table[5] – high byte |
| 21 | 0x015 | Channel 1 ADC Table[5] – low byte |
| 22 | 0x016 | Channel 1 ADC Table[6] – high byte |
| 23 | 0x017 | Channel 1 ADC Table[6] – low byte |
| 24 | 0x018 | Channel 1 ADC Table[7] – high byte |
| 25 | 0x019 | Channel 1 ADC Table[7] – low byte |
| 26 | 0x01A | Channel 1 ADC Table[8] – high byte |
| 27 | 0x01B | Channel 1 ADC Table[8] – low byte |
| 28 | 0x01C | Channel 1 ADC Table[9] – high byte |
| 29 | 0x01D | Channel 1 ADC Table[9] – low byte |
| 30 | 0x01E | Channel 1 DB Table[0] – high byte |
| 31 | 0x01F | Channel 1 DB Table[0] – low byte |
| 32 | 0x020 | Channel 1 DB Table[1] – high byte |
| 33 | 0x021 | Channel 1 DB Table[1] – low byte |
| 34 | 0x022 | Channel 1 DB Table[2] – high byte |
| 35 | 0x023 | Channel 1 DB Table[2] – low byte |
| 36 | 0x024 | Channel 1 DB Table[3] – high byte |
| 37 | 0x025 | Channel 1 DB Table[3] – low byte |
| 38 | 0x026 | Channel 1 DB Table[4] – high byte |
| 39 | 0x027 | Channel 1 DB Table[4] – low byte |
| 40 | 0x028 | Channel 1 DB Table[5] – high byte |
| 41 | 0x029 | Channel 1 DB Table[5] – low byte |
| 42 | 0x02A | Channel 1 DB Table[6] – high byte |
| 43 | 0x02B | Channel 1 DB Table[6] – low byte |
| 44 | 0x02C | Channel 1 DB Table[7] – high byte |
| 45 | 0x02D | Channel 1 DB Table[7] – low byte |
| 46 | 0x02E | Channel 1 DB Table[8] – high byte |
| 47 | 0x02F | Channel 1 DB Table[8] – low byte |
| 48 | 0x030 | Channel 1 DB Table[9] – high byte |
| 49 | 0x031 | Channel 1 DB Table[9] – low byte |
| 50 | 0x032 | 0xFF |
| 51 | 0x033 | 0xFF |
| 52 | 0x034 | Channel 2 Max DB value – high byte |
| 53 | 0x035 | Channel 2 Max DB value – low byte |
| 54 | 0x036 | Channel 2 RDAC1 value – high byte |
| 55 | 0x037 | Channel 2 RDAC1 value – high byte |
| 56 | 0x038 | Channel 2 RDAC2 value – low byte |
| 57 | 0x039 | Channel 2 RDAC2 value – high byte |
| 58 | 0x03A | Channel 2 ADC Table[0] – low byte |
| 59 | 0x03B | Channel 2 ADC Table[0] – low byte |
| 60 | 0x03C | Channel 2 ADC Table[1] – high byte |
| 61 | 0x03D | Channel 2 ADC Table[1] – low byte |
| 62 | 0x03E | Channel 2 ADC Table[2] – high byte |
| 63 | 0x03F | Channel 2 ADC Table[2] – low byte |
| 64 | 0x040 | Channel 2 ADC Table[3] – high byte |
| 65 | 0x041 | Channel 2 ADC Table[3] – low byte |
| 66 | 0x042 | Channel 2 ADC Table[4] – high byte |
| 67 | 0x043 | Channel 2 ADC Table[4] – low byte |
| 68 | 0x044 | Channel 2 ADC Table[5] – high byte |
| 69 | 0x045 | Channel 2 ADC Table[5] – low byte |
| 70 | 0x046 | Channel 2 ADC Table[6] – high byte |
| 71 | 0x047 | Channel 2 ADC Table[6] – low byte |
| 72 | 0x048 | Channel 2 ADC Table[7] – high byte |
| 73 | 0x049 | Channel 2 ADC Table[7] – low byte |
| 74 | 0x04A | Channel 2 ADC Table[8] – high byte |
| 75 | 0x04B | Channel 2 ADC Table[8] – low byte |
| 76 | 0x04C | Channel 2 ADC Table[9] – high byte |
| 77 | 0x04D | Channel 2 ADC Table[9] – low byte |
| 78 | 0x04E | Channel 2 DB Table[0] – high byte |
| 79 | 0x04F | Channel 2 DB Table[0] – low byte |
| 80 | 0x050 | Channel 2 DB Table[1] – high byte |
| 81 | 0x051 | Channel 2 DB Table[1] – low byte |
| 82 | 0x052 | Channel 2 DB Table[2] – high byte |
| 83 | 0x053 | Channel 2 DB Table[2] – low byte |
| 84 | 0x054 | Channel 2 DB Table[3] – high byte |
| 85 | 0x055 | Channel 2 DB Table[3] – low byte |
| 86 | 0x056 | Channel 2 DB Table[4] – high byte |
| 87 | 0x057 | Channel 2 DB Table[4] – low byte |
| 88 | 0x058 | Channel 2 DB Table[5] – high byte |
| 89 | 0x059 | Channel 2 DB Table[5] – low byte |
| 90 | 0x05A | Channel 2 DB Table[6] – high byte |
| 91 | 0x05B | Channel 2 DB Table[6] – low byte |
| 92 | 0x05C | Channel 2 DB Table[7] – high byte |
| 93 | 0x05D | Channel 2 DB Table[7] – low byte |
| 94 | 0x05E | Channel 2 DB Table[8] – high byte |
| 95 | 0x05F | Channel 2 DB Table[8] – low byte |
| 96 | 0x060 | Channel 2 DB Table[9] – high byte |
| 97 | 0x061 | Channel 2 DB Table[9] – low byte |
| 98 | 0x062 | 0xFF |
| 99 | 0x063 | 0xFF |
| 100 | 0x064 | Channel 3 Max DB value – high value |
| 101 | 0x065 | Channel 3 Max DB value – low value |
| 102 | 0x066 | Channel 3 RDAC1 value – high byte |
| 103 | 0x067 | Channel 3 RDAC1 value – low byte |
| 104 | 0x068 | Channel 3 RDAC2 value – high byte |
| 105 | 0x069 | Channel 3 RDAC2 value – low byte |
| 106 | 0x06A | Channel 3 ADC Table[0] – high byte |
| 107 | 0x06B | Channel 3 ADC Table[0] – low byte |
| 108 | 0x06C | Channel 3 ADC Table[1] – high byte |
| 109 | 0x06D | Channel 3 ADC Table[1] – low byte |
| 110 | 0x06E | Channel 3 ADC Table[2] – high byte |
| 111 | 0x06F | Channel 3 ADC Table[2] – low byte |
| 112 | 0x070 | Channel 3 ADC Table[3] – high byte |
| 113 | 0x071 | Channel 3 ADC Table[3] – low byte |
| 114 | 0x072 | Channel 3 ADC Table[4] – high byte |
| 115 | 0x073 | Channel 3 ADC Table[4] – low byte |
| 116 | 0x074 | Channel 3 ADC Table[5] – high byte |
| 117 | 0x075 | Channel 3 ADC Table[5] – low byte |
| 118 | 0x076 | Channel 3 ADC Table[6] – high byte |
| 119 | 0x077 | Channel 3 ADC Table[6] – low byte |
| 120 | 0x078 | Channel 3 ADC Table[7] – high byte |
| 121 | 0x079 | Channel 3 ADC Table[7] – low byte |
| 122 | 0x07A | Channel 3 ADC Table[8] – high byte |
| 123 | 0x07B | Channel 3 ADC Table[8] – low byte |
| 124 | 0x07C | Channel 3 ADC Table[9] – high byte |
| 125 | 0x07D | Channel 3 ADC Table[9] – low byte |
| 126 | 0x07E | Channel 3 DB Table[0] – high byte |
| 127 | 0x07F | Channel 3 DB Table[0] – low byte |
| 128 | 0x080 | Channel 3 DB Table[1] – high byte |
| 129 | 0x081 | Channel 3 DB Table[1] – low byte |
| 130 | 0x082 | Channel 3 DB Table[2] – high byte |
| 131 | 0x083 | Channel 3 DB Table[2] – low byte |
| 132 | 0x084 | Channel 3 DB Table[3] – high byte |
| 133 | 0x085 | Channel 3 DB Table[3] – low byte |
| 134 | 0x086 | Channel 3 DB Table[4] – high byte |
| 135 | 0x087 | Channel 3 DB Table[4] – low byte |
| 136 | 0x088 | Channel 3 DB Table[5] – high byte |
| 137 | 0x089 | Channel 3 DB Table[5] – low byte |
| 138 | 0x08A | Channel 3 DB Table[6] – high byte |
| 139 | 0x08B | Channel 3 DB Table[6] – low byte |
| 140 | 0x08C | Channel 3 DB Table[7] – high byte |
| 141 | 0x08D | Channel 3 DB Table[7] – low byte |
| 142 | 0x08E | Channel 3 DB Table[8] – high byte |
| 143 | 0x08F | Channel 3 DB Table[8] – low byte |
| 144 | 0x090 | Channel 3 DB Table[9] – high byte |
| 145 | 0x091 | Channel 3 DB Table[9] – low byte |
| 146 | 0x092 | 0xFF |
| 147 | 0x093 | 0xFF |
| 148 | 0x094 | Channel 4 Max DB value – high value |
| 149 | 0x095 | Channel 4 Max DB value – low value |
| 150 | 0x096 | Channel 4 RDAC1 value – high byte |
| 151 | 0x097 | Channel 4 RDAC1 value – low byte |
| 152 | 0x098 | Channel 4 RDAC2 value – high byte |
| 153 | 0x099 | Channel 4 RDAC2 value – low byte |
| 154 | 0x09A | Channel 4 ADC Table[0] – high byte |
| 155 | 0x09B | Channel 4 ADC Table[0] – low byte |
| 156 | 0x09C | Channel 4 ADC Table[1] – high byte |
| 157 | 0x09D | Channel 4 ADC Table[1] – low byte |
| 158 | 0x09E | Channel 4 ADC Table[2] – high byte |
| 159 | 0x09F | Channel 4 ADC Table[2] – low byte |
| 160 | 0x0A0 | Channel 4 ADC Table[3] – high byte |
| 161 | 0x0A1 | Channel 4 ADC Table[3] – low byte |
| 162 | 0x0A2 | Channel 4 ADC Table[4] – high byte |
| 163 | 0x0A3 | Channel 4 ADC Table[4] – low byte |
| 164 | 0x0A4 | Channel 4 ADC Table[5] – high byte |
| 165 | 0x0A5 | Channel 4 ADC Table[5] – low byte |
| 166 | 0x0A6 | Channel 4 ADC Table[6] – high byte |
| 167 | 0x0A7 | Channel 4 ADC Table[6] – low byte |
| 168 | 0x0A8 | Channel 4 ADC Table[7] – high byte |
| 169 | 0x0A9 | Channel 4 ADC Table[7] – low byte |
| 170 | 0x0AA | Channel 4 ADC Table[8] – high byte |
| 171 | 0x0AB | Channel 4 ADC Table[8] – low byte |
| 172 | 0x0AC | Channel 4 ADC Table[9] – high byte |
| 173 | 0x0AD | Channel 4 ADC Table[9] – low byte |
| 174 | 0x0AE | Channel 4 DB Table[0] – high byte |
| 175 | 0x0AF | Channel 4 DB Table[0] – low byte |
| 176 | 0x0B0 | Channel 4 DB Table[1] – high byte |
| 177 | 0x0B1 | Channel 4 DB Table[1] – low byte |
| 178 | 0x0B2 | Channel 4 DB Table[2] – high byte |
| 179 | 0x0B3 | Channel 4 DB Table[2] – low byte |
| 180 | 0x0B4 | Channel 4 DB Table[3] – high byte |
| 181 | 0x0B5 | Channel 4 DB Table[3] – low byte |
| 182 | 0x0B6 | Channel 4 DB Table[4] – high byte |
| 183 | 0x0B7 | Channel 4 DB Table[4] – low byte |
| 184 | 0x0B8 | Channel 4 DB Table[5] – high byte |
| 185 | 0x0B9 | Channel 4 DB Table[5] – low byte |
| 186 | 0x0BA | Channel 4 DB Table[6] – high byte |
| 187 | 0x0BB | Channel 4 DB Table[6] – low byte |
| 188 | 0x0BC | Channel 4 DB Table[7] – high byte |
| 189 | 0x0BD | Channel 4 DB Table[7] – low byte |
| 190 | 0x0BE | Channel 4 DB Table[8] – high byte |
| 191 | 0x0BF | Channel 4 DB Table[8] – low byte |
| 192 | 0x0C0 | Channel 4 DB Table[9] – high byte |
| 193 | 0x0C1 | Channel 4 DB Table[9] – low byte |
| 194 | 0x0C2 | 0xFF |
| 195 | 0x0C3 | 0xFF |
| 196 | 0x0C4 | DAC Table[0] – high byte |
| 197 | 0x0C5 | DAC Table[0] – low byte |
| 198 | 0x0C6 | DAC Table[1] – high byte |
| 199 | 0x0C7 | DAC Table[1] – low byte |
| 200 | 0x0C8 | DAC Table[2] – high byte |
| 201 | 0x0C9 | DAC Table[2] – low byte |
| 202 | 0x0CA | DAC Table[3] – high byte |
| 203 | 0x0CB | DAC Table[3] – low byte |
| 204 | 0x0CC | DAC Table[4] – high byte |
| 205 | 0x0CD | DAC Table[4] – low byte |
| 206 | 0x0CE | DAC Table[5] – high byte |
| 207 | 0x0CF | DAC Table[5] – low byte |
| 208 | 0x0D0 | DAC Table[6] – high byte |
| 209 | 0x0D1 | DAC Table[6] – low byte |
| 210 | 0x0D2 | DAC Table[7] – high byte |
| 211 | 0x0D3 | DAC Table[7] – low byte |
| 212 | 0x0D4 | DAC Table[8] – high byte |
| 213 | 0x0D5 | DAC Table[8] – low byte |
| 214 | 0x0D6 | DAC Table[9] – high byte |
| 215 | 0x0D7 | DAC Table[9] – low byte |
| 216 | 0x0D8 | DB Table[0] – high byte |
| 217 | 0x0D9 | DB Table[0] – low byte |
| 218 | 0x0DA | DB Table[1] – high byte |
| 219 | 0x0DB | DB Table[1] – low byte |
| 220 | 0x0DC | DB Table[2] – high byte |
| 221 | 0x0DD | DB Table[2] – low byte |
| 222 | 0x0DE | DB Table[3] – high byte |
| 223 | 0x0DF | DB Table[3] – low byte |
| 224 | 0x0E0 | DB Table[4] – high byte |
| 225 | 0x0E1 | DB Table[4] – low byte |
| 226 | 0x0E2 | DB Table[5] – high byte |
| 227 | 0x0E3 | DB Table[5] – low byte |
| 228 | 0x0E4 | DB Table[6] – high byte |
| 229 | 0x0E5 | DB Table[6] – low byte |
| 230 | 0x0E6 | DB Table[7] – high byte |
| 231 | 0x0E7 | DB Table[7] – low byte |
| 232 | 0x0E8 | DB Table[8] – high byte |
| 233 | 0x0E9 | DB Table[8] – low byte |
| 234 | 0x0EA | DB Table[9] – high byte |
| 235 | 0x0EB | DB Table[9] – low byte |
| 236 | 0x0EC | 0xFF |
| 237 | 0x0ED | 0xFF |
| 238 | 0x0EE | 0xFF |
| 239 | 0x0EF | 0xFF |
| 240 | 0x0F0 | 0xFF |
| 241 | 0x0F1 | 0xFF |
| 242 | 0x0F2 | 0xFF |
| 243 | 0x0F3 | 0xFF |
| 244 | 0x0F4 | 0xFF |
| 245 | 0x0F5 | 0xFF |
| 246 | 0x0F6 | 0xFF |
| 247 | 0x0F7 | 0xFF |
| 248 | 0x0F8 | 0xFF |
| 249 | 0x0F9 | 0xFF |
| 250 | 0x0FA | 0xFF |
| 251 | 0x0FB | 0xFF |
| 252 | 0x0FC | 0xFF |
| 253 | 0x0FD | 0xFF |
| 254 | 0x0FE | 0xFF |
| 255 | 0x0FF | 0xFF |